REMARKS

Table 1 has been amended to correct the "total" of FA, MA, and Borax in each of the listed monomer mixtures.

In response to the Office Action of April 5, 2004, main claim 8 has been amended to correct the spelling of furfuryl in line 3; to more specifically define the impregnating solution as a solution containing, based on the weight of the solution, from 1.9 to 5.1% of borax, from 1.9 to 5.1% of maleic anhydride or maleic acid, from 4.8 to 33.3% of furfuryl alcohol and the balance water; to more specifically define the curing temperature as being in a range of from 70 to 140°C; and to include the percentage of from 6.3 to 48.3% of the furan polymer in the impregnated wood. A sodium salt of a lignosulfonic acid is no longer included in the solution.

Support for the ranges of the components of the solution can be found in Table 1 on page 6 of the specification. "FA" is furfuryl alcohol and "MA" is maleic anhydride. Maleic anhydride forms maleic acid when added to water so this is support for maleic acid also. Support for the curing temperature range can be found in claim 9 which has been cancelled. Support for the amount of furan polymer in the impregnated wood for the lower value of 6.3% in Table 1 on page 6 under "% wt increase-Beech," line 3 and for the upper value of 48.3% in Table 2 on page 6 under "% poly uptake," line 7. The amounts of 23.1% furfuryl alcohol, 5.1% of maleic anhydride and 5.1% of borax used in the impregnating solution of Table 2 are within the ranges set forth in claim 8.

As noted in the Reply filed December 17, 2003, impregnating wood with a furfuryl alcohol solution and polymerizing it to produce a useful furan polymer impregnated wood product is disclosed, for example in WO 02/30638, published April 18, 2002. Typically the wood is impregnated with an undiluted polymerizable solution of furfuryl

alcohol, and a chemical initiator. While the previous Reply indicated that water was present, this was not correct. As noted in the discussion of this treatment method on page 1, lines 22-32 of the specification (NO-A-2005137 is a counterpart of WO 02/30638), the solution was "an undiluted treating solution." While treatment with this solution resulted in retention values of the furan polymer formed of up to 200% of the weight of the dry wood for soft woods and up to 100% for hard woods, the disadvantage with this treatment was the large amounts of chemical used and the resulting cost. Furfuryl alcohol is water soluble and easily forms a uniform solution with water. See page 1, lines 34-35 of the specification. Thus applicant considered using an aqueous impregnating solution of furfuryl alcohol instead to reduce costs. However, furfuryl alcohol that has been initiated with a chemical initiator to make it polymerize does not mix well with water, resulting in a solution that separates. Moreover, the wood may not be impregnated uniformly with the polymer. See page 2, lines 3-8 of the specification.

Applicant found, however, that by including borax in the impregnating solution, a more uniform distribution of furan polymer in the wood could be achieved leading to a more uniform color in and density of the furan polymer impregnated wood product. Typical treating solutions for use in the present invention are set forth in Table 2 on page 6 of the specification. They are aqueous solutions of furfuryl alcohol, maleic anhydride as the polymerization initiator and borax. Note from these tables and as now set forth in main claim 8, the resulting impregnated wood has a furan polymer content of from 6.3 to 48.3%.

While the content of polymer in the impregnated wood is less than when an undiluted solution of furfuryl alcohol is used (see Table 1 - "Initiated FA" which contained 93.9% of furfuryl alcohol (FA) and 6.5% of maleic anhydride (MA) as an initiator, but no water or borax), the percentage of polymer uptake was higher than would have been expected based on the amount of furfuryl alcohol present. Note, for example, with an aqueous impregnating solution containing only 33.3% of FA the percentage increase in wood weight for pine was 30.9%, whereas with an undiluted solution containing 93.9% of FA (nearly three times more FA), the percentage increase in wood weight for pine was 57.4%, or slightly less than twice as much, Moreover the % ASE (anti-swell efficiency) was only 30% better for the undiluted treating solution compared to the diluted one, i.e., 58 versus 44 for pine. This is further exemplified in Table 3.

Thus applicant has achieved with the method of this invention an improved furan polymer impregnated wood product at a reduced cost.

In the Office Action, the Examiner continued to reject claims 8-12 under 35 U.S.C. §103(a) for being obvious over U.S. Patent No. 4,678,715 to Geibeler et al. (hereafter Geibeler) in view of U.S. Patent No. 5,804,591 to Valcke et al. (hereafter Valcke), a published U.S. Patent application No. 2003/0148965 to Hofer et al. (hereafter Hofer), and EP 1069173 (hereafter EP'173). The rejection in view of Hofer et al. is now moot in view of the deletion of a sodium salt of a lignosulfonic acid from the claims.

The primary reference to Geibeler discloses a process for treating wood with monomeric reactive compounds of thermosetting polymers. Reactive components contemplated may include, *inter alia*, maleic acid or anhydride (column 3, lines 6 and 7)

and furfuryl alcohol (column 3, line 67). The reactive components can be introduced into the wood as a solution in water (column 3, lines 17-19).

First of all, as noted in the last Reply, there is no teaching in Geibeler that the furfuryl alcohol and the maleic acid or anhydride are used together as the reactive components. The Examiner argues in the above Office Action, that since Geibeler refers to these both as "reactive components," that they necessarily are considered capable of reacting with one another. "Capable" is not the issue. The issue is whether or not, in fact, they are reacted and, a closer reading of Geibeler will show this is not true.

In column 3, lines 6 and 7, Geibeler teaches that "maleic acid or anhydride "can be used as the" polymerizable monomeric substance." Emphasis added. Then in column 3, lines 8-11, it teaches that "other" reactive components include "furfuryl alcohol," but that when it is used "an aldehyde or ketone" is required as "a coreactant." Thus Geibeler teaches that furfuryl alcohol and an aldehyde or ketone can be reacted together, but there is no teaching that maleic acid or anhydride, which is not an "aldehyde or a ketone," can be reacted with furfuryl alcohol. On the contrary, when maleic acid or anhydride is used, it is used alone as "a polymerizable monomeric substance." Column 3, line 3 of Geibeler. This is consistent with the rest of the teachings of Geibeler which note that the preferred reactive components are "phenol and formaldehyde" (column 3, line 42) or furfuryl alcohol or phenolic components and formaldehyde (column 3, line 66 to column 4, line 1). Furfuryl alcohol is never reacted with maleic acid or anhydride, nor is there any suggestion in Geibeler that it should. The only substances suggested to be coreacted with furfuryl alcohol are "an aldehyde

or ketone." While this may form "a furan polymer," it is not the furan polymer of the claims.

Secondly, as noted by the Examiner, Geibeler does not teach anything about the presence of borax in the solution as required by applicant's claims. As demonstrated in the specification, it is the presence of this stabilizer that enables the furfuryl alcohol monomer, initiated by maleic anhydride, to be water soluble, thereby providing a uniform distribution of initiated monomer in the solution used to treat the wood, which results in a furan polymer impregnated wood product having uniform color and density. See page 2, lines 15-17 and page 3, lines 2-6 of the specification.

The secondary references to Valcke and EP'173 may show solutions for treating wood containing borax. However, none of the solutions have anything to do with any polymerizable solutions for impregnating wood, let alone a polymerizable furfuryl alcohol monomer solution, to obtain a polymer impregnated wood product. Valcke relates to a fungicidal composition and EP'173 to an anti-inflammatory composition. More importantly, none of these references teach or even remotely suggest that the use of borax will make chemically initiated furfuryl alcohol monomer more uniformly soluble in water.

The references may have to do with preserving wood and the wood product produced by the method of this invention is chemically preserved wood, but that is the only similarity between the references and the invention. The borax is not used here to preserve the wood per se, but to enable the furfuryl alcohol monomer to more efficiently and effectively polymerize and form a furan polymer impregnated wood product.

How then can these references be said to suggest the use of borax in a process for impregnating wood with a polymerizable furfuryl alcohol monomer? It is submitted that the only suggestion to do so comes from a reading of applicant's specification and not from anything taught by these references.

Applicant's invention overcame a problem caused by the water insolubility of initiated furfuryl alcohol monomer and there is absolutely nothing in these references that would suggest applicant's solution to this problem.

As noted in the last Reply on pages 8 and 9, the discussion of which is incorporated herein by reference, the case law requires that to combine references to support an obvious rejection, the prior art references must suggest the desirability of making the claimed combination, not applicant's specification.

Where is the "desirability" suggested in the secondary references of making the substitution suggested by the Examiner? There is nothing in these references that would suggest the result achieved by applicant's invention. As noted by the court in in re Dow Chemical Co., 837 F.2d 469, 5 U.S.P.Q. 2d 1529 (Fed. Cir. 1988) "both the suggestion of the invention and the expectation of its success must be found in the prior art" (emphasis added). See also M.P.E.P. § 716.02(a).

Finally, Geibeler teaches that "small amounts of reactive components" of thermosetting polymers are introduced into the wood (see abstract) or column 2, lines 44 and 45 resulting in polymer percentages of only "0.1 to 2.5 weight percent, relative to the dry weight of the wood" (see column 2, lines 64-65). This is because, as explained in column 1, lines 5-7, the polymer is used to preserve the wood's "dimensional stability and its resonant properties." In contrast, applicant retains much

greater quantities of the furan polymer (i.e., 6.3 to 48.3%) to chemically protect the wood from biodeterioration.

As required by M.P.E.P. §2143, to establish a prima facie case of obviousness, the references in combination must teach or suggest all of the claims' limitations. None of Geibeler, Valcke, or EP'173 teach at least the claimed ranges of components in the impregnating solution or the claimed range of furan polymer uptake. Thus for this reason also, it is submitted that the claims cannot be considered obvious over the cited combination of references.

Accordingly, for all of the foregoing reasons, it is believed claims 8 and 10-12 are in condition for allowance.

A Request for Continued Examination is being filed with this Reply to enable the Examiner to consider the amended claims at this time.

In view of the foregoing amendments and remarks, Applicant respectfully requests reconsideration and reexamination of this application and the timely allowance of the pending claims.

Please grant any extensions of time required to enter this response and charge any additional required fees to our deposit account 06-0916.

Respectfully submitted,

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